

### **REMARKS**

Applicants have amended the title of the invention, canceled claim 2, without prejudice or disclaimer of its subject matter, and amended claims 1 and 5 to more appropriately define the present invention. Claims 1 and 3-20 remain pending, with claims 7-20 withdrawn from consideration, and claims 1 and 3-6 under current examination.

#### **Regarding the Office Action:**

In the Office Action, the Examiner objected to the title of the invention; rejected claim 2 under 35 U.S.C. § 112, second paragraph; rejected claims 1, 4, and 6 under 35 U.S.C. § 102(e) as being anticipated by Ito et al. (U.S. Patent App. Pub. No. 2003/0116854A1) ("Ito"); rejected claims 1, 2, 4, and 6 under 35 U.S.C. § 103(a) as being unpatentable over Ogure et al. (U.S. Patent App. Pub. No. 2001/0055649A1) ("Ogure") in view of Dalton et al. (U.S. Patent App. Pub. No. 2003/0057414A1) ("Dalton"); rejected claim 3 under 35 U.S.C. § 103(a) as being unpatentable over Ogure and Dalton as applied to claim 1, and further in view of Ting et al. (U.S. Patent No. 5,969,422) ("Ting"); and objected to claim 5 as being dependent upon a rejected base claim, but indicated that it would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicants traverse the rejections for the following reasons.<sup>1</sup>

#### **Objection to the Title:**

The Examiner objected to the title of the application as not descriptive. Applicants have amended the title of the application, as indicated above, to be even more clearly indicative of the

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<sup>1</sup> The Office Action contains statements characterizing the related art and the claims. Regardless of whether any such statements are specifically identified herein, Applicants decline to automatically subscribe to any statements in the Office Action.

invention to which the claims are directed. Applicants request that the objection to the title be withdrawn.

**Claim Amendments:**

Support for the amendments to claims 1 and 5 can be found in the text of claim 1 and cancelled claim 2, and in the specification at, for example, page 18, lines 16-24, and FIG. 3B.

**Rejection of Claim 2 under 35 U.S.C. § 112, second paragraph:**

The rejection of claim 2 has been rendered moot by the cancellation of this claim, without prejudice or disclaimer of its subject matter. Applicants accordingly request withdrawal of this rejection.

**Rejection of Claims 1, 4, and 6 under 35 U.S.C. § 102(e):**

Applicants respectfully traverse the rejection of claims 1, 4, and 6 under 35 U.S.C. § 102(b) as anticipated by Ito.

Applicants first note that the Examiner incorrectly used a form paragraph on page 3 of the Office Action, citing that “the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).” The reference cited by the Examiner, Ito, has a U.S. filing date of September 20, 2002, and a foreign priority date of December 26, 2001, both of which are after November 29, 2000. Therefore, since Ito is not an international application filed prior to November 29, 2000, it is subject to the current provisions of 35 U.S.C. § 102(e), as set forth in M.P.E.P. § 2136:

Revised 35 U.S.C. 102(e), as amended by the American Inventors Protection Act of 1999 (AIPA) (Pub. L. 106-113, 113 Stat. 1501 (1999)), and as further amended by the Intellectual Property and High Technology Technical Amendments Act of 2002 (Pub. L. 107-273, 116 Stat. 1758 (2002)), applies in the examination of all applications, whenever filed, and the reexamination of, or other proceedings to contest, all patents. Thus, the filing date of the application being examined is no longer relevant in determining what version of 35 U.S.C. 102(e) to

apply in determining the patentability of that application, or the patent resulting from that application. The revised statutory provisions supercede all previous versions of 35 U.S.C. 102(e) and 374, with only one exception, which is when the potential reference is based on an international application filed prior to November 29, 2000 (discussed further below). The provisions amending 35 U.S.C. 102(e) and 374 in Pub. L. 107-273 are completely retroactive to the effective date of the relevant provisions in the AIPA (November 29, 2000). Revised 35 U.S.C. 102(e) allows the use of certain international application publications and U.S. patent application publications, and certain U.S. patents as prior art under 35 U.S.C. 102(e) as of their respective U.S. filing dates, including certain international filing dates. The prior art date of a reference under 35 U.S.C. 102(e) may be the international filing date if the international filing date was on or after November 29, 2000, the international application designated the United States, and the international application was published by the World Intellectual Property Organization (WIPO) under the Patent Cooperation Treaty (PCT) Article 21(2) in the English language. See MPEP § 706.02(f)(1) for examination guidelines on the application of 35 U.S.C. 102(e).

Regardless of which version of 35 U.S.C. § 102(e) on which the Examiner intends to rely, as Applicants demonstrate below, Ito does not anticipate the claimed invention.

In order to properly establish that Ito anticipates Applicants' claimed invention under 35 U.S.C. § 102, each and every element of each of the claims in issue must be found, either expressly described or under principles of inherency, in that single reference. Furthermore, "[t]he identical invention must be shown in as complete detail as is contained in the ... claim." See M.P.E.P. § 2131, quoting *Richardson v. Suzuki Motor Co.*, 868 F.2d 1126, 1236, 9 U.S.P.Q.2d 1913, 1920 (Fed. Cir. 1989).

Ito does not disclose each and every element of Applicants' claimed invention, despite the Examiner's allegations. Amended independent claim 1 recites, among other things,

a mixed layer formed between the porous film and the conductive barrier layer, and comprising a layer constituted by the porous film and having open cells exposed to the inner surface of the burying concave, and the open cells on the side of the conductive barrier layer being substantially closed by the same component as that of the conductive barrier layer.

Ito does not disclose at least these elements of independent claim 1. In particular, what the Examiner characterizes as Ito's "mixed layer 23' " is actually high Young's modulus insulation film made of metal oxide 23'. See Ito, Fig. 8E and par. [0088]. This does not constitute a "mixed layer...comprising...a layer...having open cells exposed to the inner surface of the burying concave, and the open cells on the side of the conductive barrier layer being substantially closed by the same component as that of the conductive barrier layer" (claim 1).

Thus, Ito does not disclose at least the above-quoted elements of claim 1 and the Examiner has thus not met the essential requirements of anticipation for a proper 35 U.S.C. § 102(e) rejection. Independent claim 1 is allowable, for the reasons set forth above, and dependent claims 4 and 6 are also allowable at least by virtue of their dependence from allowable base claim 1. Therefore, the improper 35 U.S.C. § 102(e) rejection of claims 1, 4, and 6 should be withdrawn.

**Rejection of Claims 1, 2, 4, and 6 under 35 U.S.C. § 103(a):**

The rejection of claim 2 has been rendered moot by the cancellation of this claim, without prejudice or disclaimer of its subject matter. Applicants traverse the rejection of claims 1, 2, 4, and 6 under 35 U.S.C. § 103(a) as being unpatentable over Ogure in view of Dalton. Applicants respectfully disagree with the Examiner's arguments and conclusions. A *prima facie* case of obviousness has not been established.

"To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on

applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)." M.P.E.P. § 2142, 8th Ed., Rev. 2 (May 2004), p. 2100-128.

A *prima facie* case of obviousness has not been established because, among other things, neither Ogure nor Dalton, nor their combination, teaches or suggests each and every element of Applicants' claims.

The Examiner admitted that "Ogure does not disclose that the organic insulating film MSQ 230 is a porous film" (Office Action, p. 4). The Examiner then cited Dalton for teaching "forming of an electrical contact within a porous MSQ film 14" (Office Action, p. 5), in an attempt to show "it would have been obvious to form the MSQ film 230 of Ogure as a porous MSQ..." (Id.)

For the sake of argument only, even if the Ogure's MSQ film were porous, the mixing layer disclosed in Ogure does not constitute "mixed layer...comprising...a layer...having open cells exposed to the inner surface of the burying concave, and the open cells on the side of the conductive barrier layer being substantially closed by the same component as that of the conductive barrier layer," as recited in Applicants' amended claim 1. The reasoning for this can be shown by a review of Ogure's par. [0128] and Figs. 17(a)-17(c). Fig. 17(a) illustrates the timing of Ta deposition 201 ("301" in par. [0128]) and N particle beam 203 ("303" in par. [0128]), in which N particle beam 203 is supplied after Ta deposition 201. As illustrated in Fig. 17(b), a Ta film layer 232 is deposited on an inner surface of a recess of the organic insulating film layer 230. "Thereafter, the Ta film layer 232 is converted into a TaN film layer 233, and at the same time, a mixing layer 231 is formed in the vicinity of the interface between the TaN film layer 233 and the organic insulating film layer 230." Ogure, par. [0128]. Mixing layer 231 is formed as shown in Fig. 17(c).

Therefore, even if the organic insulating film layer 203 is porous and opening cells are exposed to the layer 230 located on the inner surface of a recess, a mixing layer 231 containing the atoms of the organic insulating film layer 230, Ta atoms, and N atoms mixed together is formed by mixing caused by the energy supplies by the N particle beam 203 described above. It is clear that the mixing layer 231 does not have the structure in which “open cells are substantially closed by the same component as the conductive barrier layer” (Applicants’ claim 1). In other words, regardless of the type (porous or non-porous) of the organic insulating film layer 230, the mixing layer 231 formed by the above method taught by Ogure differs from the elements of Applicants’ claimed “mixed layer” (claim 1).

The Examiner’s application of Dalton to allegedly remedy Ogure’s deficiencies still fails to establish *prima facie* obviousness. Even assuming that Dalton teaches “a porous MSQ film” (Office Action, p. 5), this does not remedy Ogure’s other deficiencies pointed out in the previous paragraph. That is, Ogure and Dalton, taken alone or in combination, fail to teach or suggest at least Applicants’ claimed

a mixed layer formed between the porous film and the conductive barrier layer, and comprising a layer constituted by the porous film and having open cells exposed to the inner surface of the burying concave, and the open cells on the side of the conductive barrier layer being substantially closed by the same component as that of the conductive barrier layer (claim 1).

Applicants have therefore established that Ogure in view of Dalton, taken alone or in combination, do not teach or suggest each and every element of Applicants’ independent claim 1. Accordingly, the Examiner’s reliance on Ogure in view of Dalton fails to establish *prima facie* obviousness. Independent claim 1 is allowable, and dependent claims 4 and 6 are also allowable at least by virtue of their dependence from allowable base claim 1. Therefore, the improper 35 U.S.C. § 103(a) rejection should be withdrawn.

**Rejection of Claim 3 under 35 U.S.C. § 103(a):**

Applicants traverse the rejection of claim 3 under 35 U.S.C. § 103(a) as being unpatentable over Ogure in view of Dalton and further in view of Ting. The Examiner admitted “[n]either Ogure nor Dalton disclose that an aspect ratio (D/W) of the burying concave is 1.5 or more” (Office Action, p. 5), and cited Ting to allegedly cure this deficiency.

Applicants have already demonstrated in the previous section that Ogure in view of Dalton do not teach or suggest all the recitations of Applicants’ independent claim 1, from which claim 3 depends, in addition to the Examiner’s admission regarding dependent claim 3.

The Examiner’s application of Ting, however, to teach “forming of an interconnect pattern in a burying concave (contact hole) having an aspect ratio of 4:1 or greater” (Id.), fails to cure the deficiencies of Ogure and Dalton pertaining to independent claim 1.

Even if Ting were combined with Ogure and Dalton as the Examiner suggests, Ogure, Dalton, and Ting do not teach or suggest all the features of Applicants’ claimed invention in independent claim 1, and therefore the Examiner’s application of Ting as an additional reference does not render the recitations of Applicants’ dependent claim 3 obvious. The combination of these references fails to teach or suggest at least the following elements of Applicants’ independent claim 1:

a mixed layer formed between the porous film and the conductive barrier layer, and comprising a layer constituted by the porous film and having open cells exposed to the inner surface of the burying concave, and the open cells on the side of the conductive barrier layer being substantially closed by the same component as that of the conductive barrier layer.

The Examiner’s application of these references thus does not satisfy the tenets of a proper 35 U.S.C. § 103(a) rejection of Applicants’ dependent claim 3, in light of its dependence from

allowable base claim 1. Therefore, the improper 35 U.S.C. § 103(a) rejection of claim 3 should be withdrawn.

**Conclusion:**

In view of the foregoing, Applicants request reconsideration of the application and withdrawal of the objection and rejections. Pending claims 1 and 3-6 are in condition for allowance, and Applicants requests a favorable action.

Applicants encourage the Examiner to contact the undersigned representative by telephone to discuss any remaining issues or to resolve any misunderstandings.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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